AGENCY OF NATURAL RESOURCES
DEPARTMENT OF FORESTS, PARKS AND RECREATION

STATE OF VERMONT

FOREST INSECT AND DISEASE CONDITIONS
NORTHERN REGION
CALENDAR YEAR 1988

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INTRODUCTION

The information in this report is based on aerial surveys to detect defoliation, dieback and mortality; as well as ground surveys and observations of Forest Resource Protection personnel and other forestry staff.

Aerial surveys were flown in early to mid-June (6/8-6/13) to detect thrips defoliation and again, late in the season, beginning in August (8/5-9/2) to detect mid to late season defoliators and dieback or decline problems.

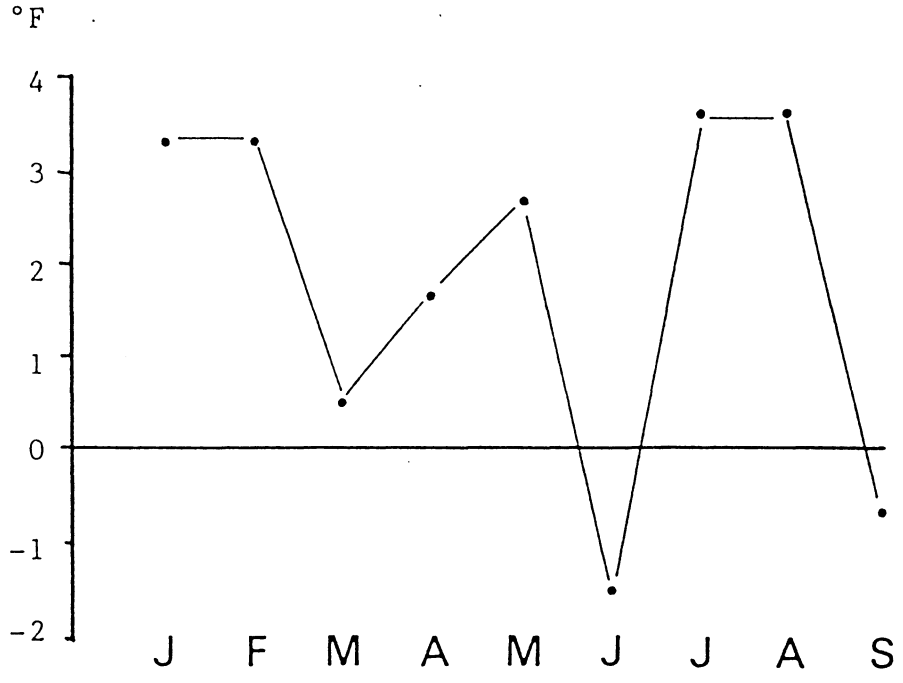
WEATHER SUMMARY

The winter of 1987-88 was generally mild, with below normal precipitation (Fig. 1). Spring was also drier than normal, with the Palmer drought index already indicating "moderate drought" in northeastern Vermont during May. This was followed by a severe dry period in June for most of the region. Lamoille, Washington, and Orange Counties were very dry during June (Fig. 2), with no measurable precipitation recorded between 1 June and 23 June. Mid-summer temperatures were also warmer than normal (Fig. 1), with the hottest July since 1975. By mid-July, the Palmer drought index registered moderate for much of the region and severe in the very northeastern corner of the state. Only the month of August showed precipitation that was above normal.

Bud-break for most trees began close to normal this spring, but leaf development was held back one to two weeks by cool and/or dry conditions. This may have been a factor in the heavy thrips damage this year. This was also a very heavy seed year for many tree species, especially maple.

The months of April, May and June were very windy, with wind speeds in excess of 10 mph on 20 days in May alone. This is likely to have increased plant evapo-transpiration, adding to the drought stress. Wind gusts up to 50 mph were recorded for 5 June in north-central Vermont. Scattered light frosts occurred during several days in May and early June, as well as in late August. Little plant damage resulted from these frosts, with the exception of young Christmas trees in a few locations.

Temperature:



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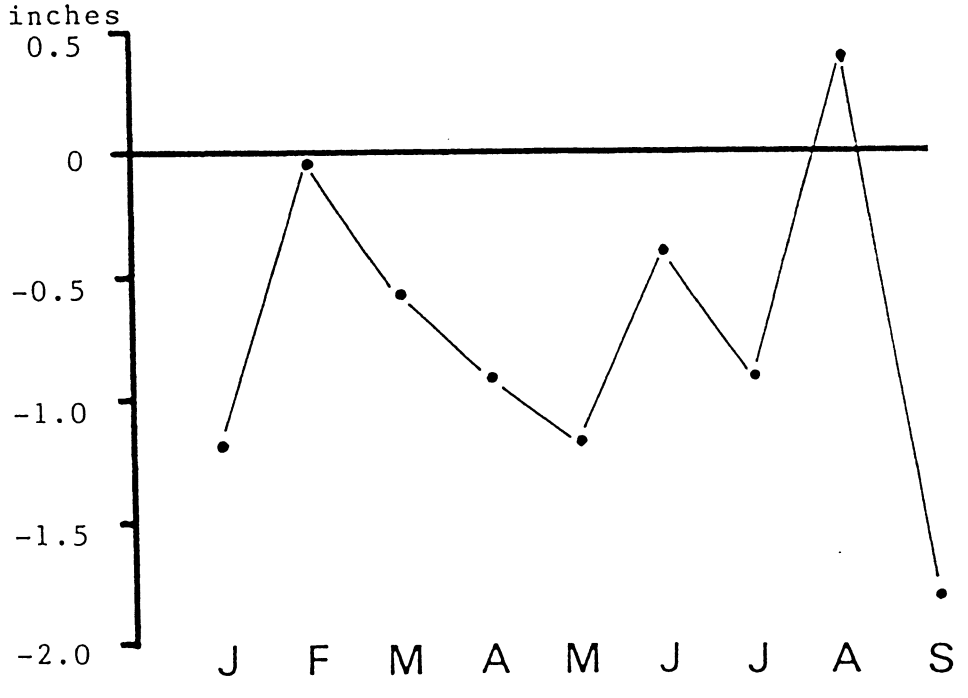
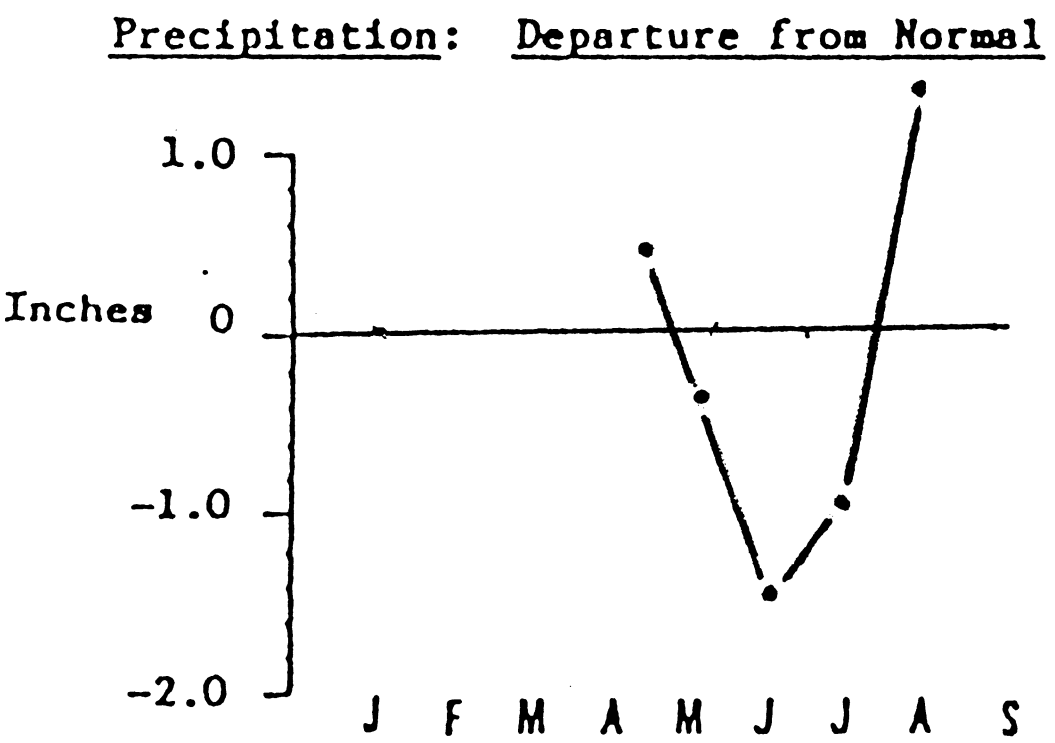


Figure 1: 1988 Weather Summary

Data from NOAA Local Climatological Data: Monthly Summary
Burlington International Airport

Figure 2. 1988 Weather Summary for District IV.

Data from Forests, Parks and Recreation stations in Wolcott, Barre, Randolph, Tunbridge and Fairlee - monthly summary.



FOREST INSECTS

Hardwood Defoliators

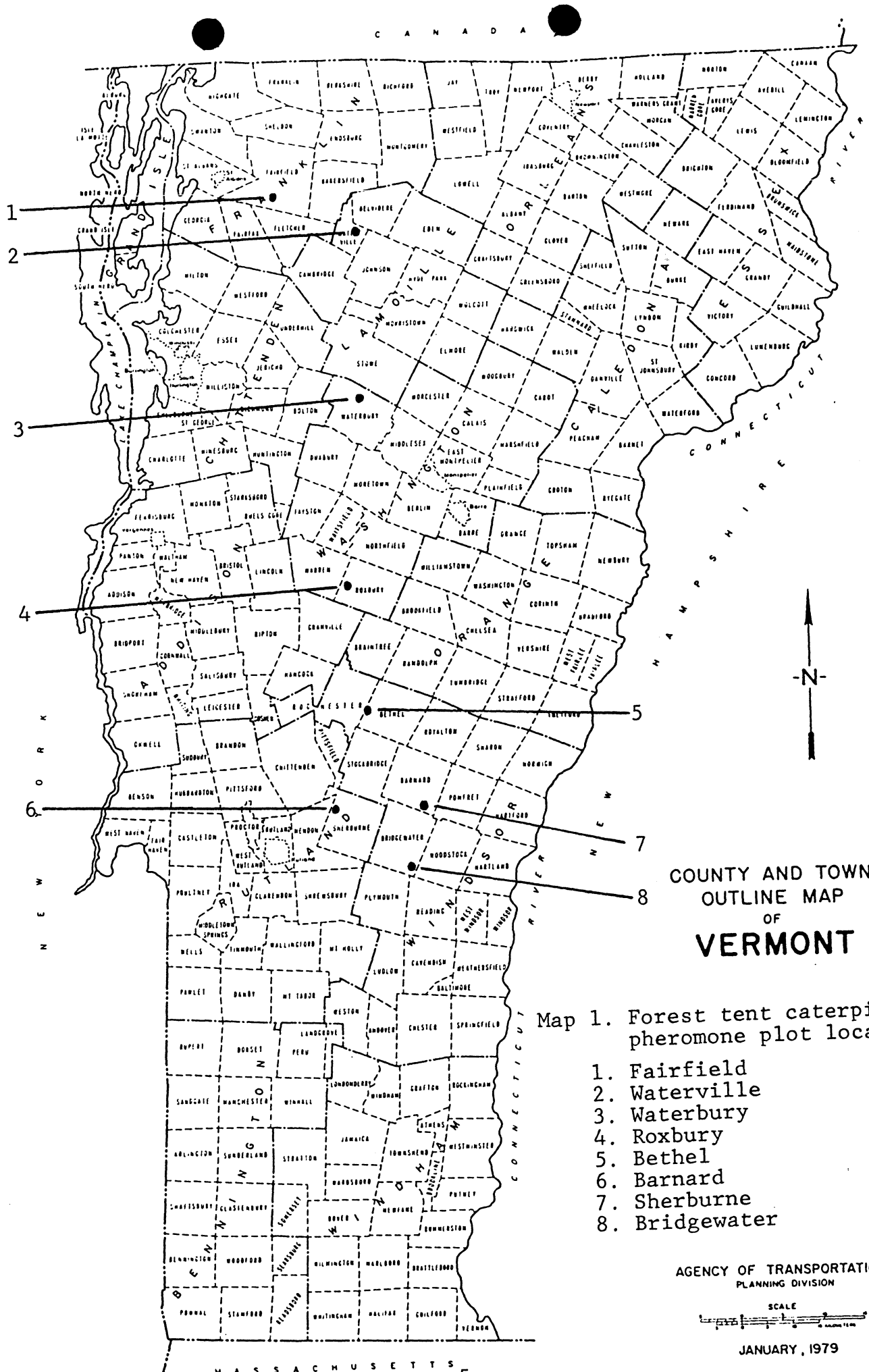
The Birch Leaf Miner, Fenusa pusilla, caused moderate to heavy defoliation of paper birch, gray birch, and occasionally yellow birch throughout most of the region. Many trees approached 100 percent defoliation by late summer and damage to yellow birch was heavier than previously observed. East Montpelier, Calais, and most of Orange County were especially heavily defoliated this year, but the defoliation was not sketch-mapped during the aerial survey. The additional stress of the June drought may cause additional problems for these trees in the near future.

Forest Tent Caterpillar, Malacosoma disstria, caused only light defoliation this year, but larvae were much more abundant than in 1987. They were frequently observed within sugar maple stands as well as on some ornamental maples.

Pheromone traps (five traps per stand) were placed in eight sugar maple stands, with the addition of plots in Sherburne and Bridgewater (Map 1). The Reed three-component lure that we had used successfully in the past was not available this year so we used two and three-component lures made by RPC. Trap catch was more variable with these lures than the Reed lure, but more moths were caught than with the RPC lures (2-component) that were tried in three of the locations in 1987 (Table 1).

Table 1. Forest tent caterpillar moth catch in pheromone traps 1987-1988.

	Average number of moths per trap			
	1987		1988	
Location	Reed lure	RPC-2 lure	RPC-3 lure	RPC-2 lure
Roxbury	2.0	0.0	0.0	0.0
Waterbury	2.0	0.2	1.0	1.2
Waterville	6.6	0.0	2.2	0.2
Fairfield	4.8	-	0.2	-
Bethel	2.0	-	1.8	-
Barnard	13.6	-	1.8	1.0
Bridgewater	-	-	17.6	-
Sherburne	-	-	15.0	-
Ave. for all sites	5.2	0.07	5.0	0.6


CANADA
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-N-
COUNTY AND TOWN
OUTLINE MAP
OF
VERMONT
Map 1. Forest tent caterpillar pheromone plot locations.
1. Fairfield
2. Waterville
3. Waterbury
4. Roxbury
5. Bethel
6. Barnard
7. Sherburne
8. Bridgewater
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MASSACHUSETTS

High trap catches in Bridgewater and Sherburne may indicate that forest tent caterpillar is starting to build up in these areas. During the past outbreak, heavy defoliation showed up first in this part of the state (Rutland and Windsor Counties) before spreading statewide. The average trap catch with RPC three-component lures in 1988 for all sites in Table 1 is 5.0. This compares with an average of only 0.1 for eight sites in the Green Mountain National Forest trapped by the U.S. Forest Service using three traps per site. The reason for this difference is unclear, but our observations, based on larvae, 1988 vs. 1987 trap catch with the two-component lure, and more recently, noticeable egg masses in one Orange County location, indicate that this insect is increasing in numbers.

Gypsy moth, Lymantria dispar, populations continue to build in some areas. Four acres of defoliation were detected in Milton during the annual aerial survey (Map 2). This may be a small area, but it's the first aerial detection of gypsy moth defoliation since 1982, verifying that populations are increasing.

Gypsy moth milk carton pheromone traps were placed in 10 locations compared to three in 1987. Moth catch was much lower than in 1987, but there is some question about the effectiveness of the lures used this year (Table 2). With the exception of the Trailer Park location, the highest trap catch was in the area of noticeable defoliation (Arrowhead Mountain).

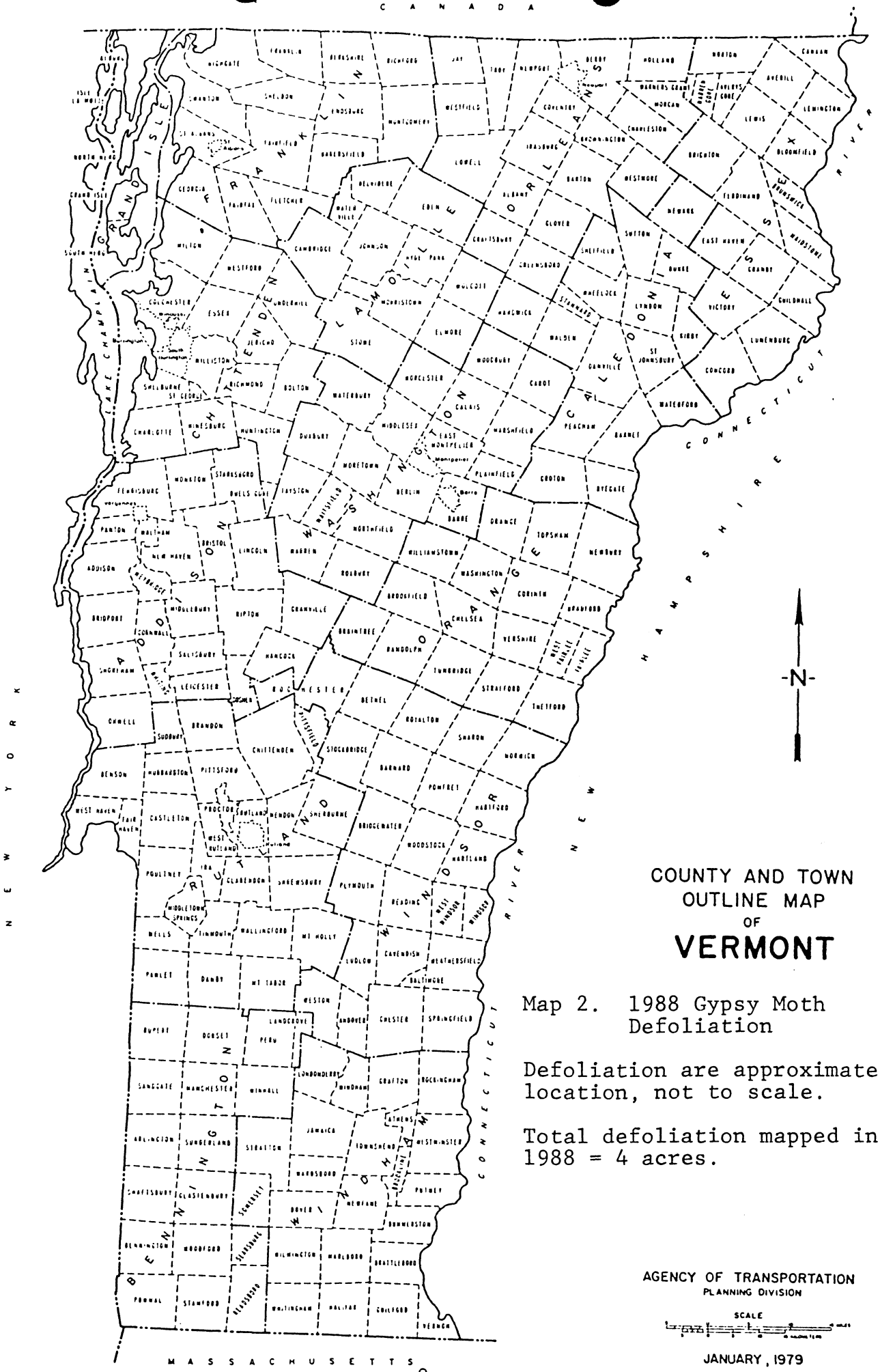
Egg mass counts indicate that populations are either remaining fairly constant at low levels or are increasing, but are not decreasing (Table 2). Visible defoliation is likely in a few scattered locations in 1989, including Arrowhead Mountain and Sandbar in Milton, and the Blakely Road area in Colchester.

A field experiment to determine whether gypsy moth outbreaks can be suppressed by treating "foci" to prevent spread to surrounding areas was initiated in May. Focal areas are located on Map 3. Two focal areas - Perch Pond in Benson (420 acres) and Brigham Hill in Colchester (85 acres) - were aerially sprayed on 27 May using an aqueous formulation (SAN 415 SC 32 LV) of the NRD-12 strain of Bacillus thuringiensis at 20 BIU per acre. This was a cooperative pilot project with the USDA-Forest Service. Gypsy moth populations within, adjacent to, and outside (checks) of the treated areas were surveyed this year and will continue to be monitored in future years to determine the effect of this "early intervention" when populations were first beginning to build. Early indications are that populations were suppressed whenever spray coverage was adequate.

Table 2. Gypsy moth population counts from focal area and other monitoring plots, 1987-1988.

Location	#of Larvae & Pupae[1] 1987	1988	#of Moths[2] 1987	1988	#of Egg Masses[3] 1987	1988
(F) Brigham Hill (Colchester)[5]	598	-	193	24	37	28
(F) Arrowhead (Milton)	89	-	127	70	21	48
(F) Middlesex	8	18	66	24	0	1
(F) Sandbar	211	2124	-	-	45	173
Edgewater (Milton)	-	-	370	23	0.6	0.6
Church (Essex)	-	-	-	23	-	-
Pinewood Manor (Essex)	-	-	-	34	-	0
Trailer Park (Essex)	-	-	-	88	-	2
Mississquoi H.S. (Swanton)	-	-	-	33	-	3
St. Albans	-	-	-	6	-	-
Essex Office	-	-	-	4	-	-
Blakely Rd.	-	-	-	-	-	119
North Hero S.P.	-	-	-	-	-	11
USFS-GMNF[6]	-	-	80	9	-	-

1. Average number per plot under burlap bands in two, 15-meter diameter (.045 acre) plots at peak 5th instar.
2. Total count per one milk carton trap for each location.
3. Average number per plot in 15m diameter plots.
4. (F) = burlap-banded, focal area plots.
5. Brigham Hill plots aerially sprayed with B.t. in 1988.
6. Mean for five locations; data from I. Millers, USDA-Forest Service, S&PF, Durham, NH.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Map 2. 1988 Gypsy Moth Defoliation

Defoliation are approximate location, not to scale.

Total defoliation mapped in 1988 = 4 acres.

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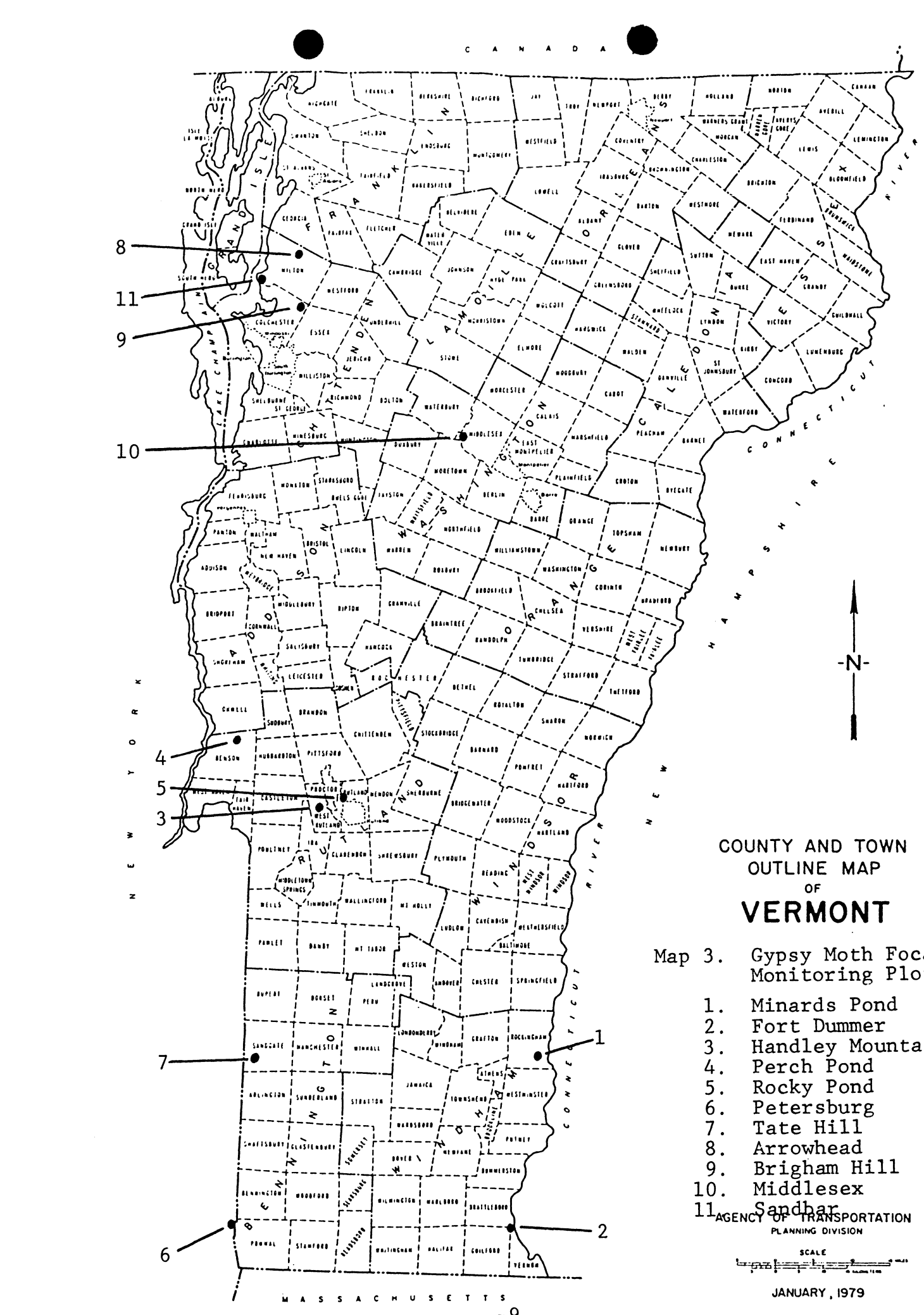

COUNTY AND TOWN OUTLINE MAP OF VERMONT

Map 3. Gypsy Moth Focal Area Monitoring Plots

1. Minards Pond
2. Fort Dummer
3. Handley Mountain
4. Perch Pond
5. Rocky Pond
6. Petersburg
7. Tate Hill
8. Arrowhead
9. Brigham Hill
10. Middlesex
11. Sandbar

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Maple Leaf Cutter, Paraclemensia acerifoliella, caused mostly light defoliation, but was more common than in 1987. Moderate defoliation was observed in one Franklin County sugarbush.

Saddled Prominent, Heterocampa guttivata, appears to be increasing, especially in the Orange County towns that received heavy defoliation during the 1980-81 outbreak. Occasional larvae were observed throughout much of the region, but were especially numerous by early August in the Vershire/Strafford area, where light defoliation (not noticeable by aerial survey) occurred. This raised concern among several landowners who experienced considerable sugar maple mortality during the previous outbreak. Pupae were easy to find on the Bushnell property in Strafford on 29 August, with 40 being collected in one and one-half hours by three individuals. Egg surveys in late June/early July are planned for areas of concern.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
American Aspen Beetle Gonioctena americana			Not observed.
American Dagger Moth Acronicta americana			Not observed.
Birch Leaf Folder Ancylis discigerana	Yellow Birch	Lamoille Washington Orange Chittenden Counties	Light, scattered defoliation similar to 1987.
Birch Leaf Miner Fenusa pusilla			See narrative.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Birch Skeletonizer *Bucculatrix canadensisella*	White Birch Yellow Birch	Lamoille Washington Orange Essex Counties	Light, scattered defoliation.
Bruce Spanworm *Operophtera bruceata*	Sugar Maple	Moretown Cabot	Few larvae and very light defoliation observed; none seen in 1987.
Cherry Scallop Shell Moth *Hydria prunivorata*			Not observed.
Early Birch Leaf Edgeminer *Messa nana*			Not observed.
Eastern Tent Caterpillar *Malacosoma americanum*	Cherry Apple	Widespread Common	Populations up slightly from 1987.
Elm Leaf Beetle *Pyrrhalta luteola*	American Elm Chinese Elm	Scattered throughout	Low populations, similar to 1987.
Fall Cankerworm *Alsophila pometaria*			Not observed.
Fall Webworm *Hyphantrea cunea*	Cherry Apple Maple and other hardwoods	Widespread	Scattered; light but increasing over 1987 levels.
Forest Tent Caterpillar *Malacosoma disstria*			See narrative.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Maple Leaf Cutter *Paraclemensia acerifoliella*			See narrative.
Maple Trumpet Skeletonizer *Epinotia aceriella*	Sugar Maple Red Maple	Widespread	Mostly light defoliation but populations definitely increased over past levels; caused some concern on shade maples.
Maple Webworm *Tetralopha asperatella*	Sugar Maple	All areas except Northeast Kingdom	Light defoliation common in many sugarbushes for the first time in several years.
Mountain Ash Sawfly *Pristiphora geniculata*	Mountain Ash	Caledonia County	Only one report. Down dramatically from previous years.
Oak Skeletonizer *Bucculatrix ainsliella*			Not observed.
Orange-humped Mapleworm *Symmerista leucitys*	Sugar Maple	Fairfield	One colony of larvae observed.
Pear Sawfly	Hawthorne	Danville	Heavy on one ornamental.
Pin Oak Sawfly *Caliroa sp.*			Not observed.
Red-humped Oakworm *Symmerista canicosta*	Red Oak	Georgia	On one small oak.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Green Striped Mapleworm *Anisota rubicunda*	Red Maple Sugar Maple	Scattered	Scattered individual larvae observed.
Gypsy Moth *Lymantria dispar*			See narrative.
Half Winged Geometer *Phigalia titea*	Red Oak Sugar Maple	Middlesex	A few larvae seen in gypsy moth focal area plot, similar to 1987.
Japanese Beetle *Popillia japonica*	Ornamentals	Chittenden Addison Caledonia Franklin Washington Counties	Moderate to heavy defoliation of individual plants, similar to 1987.
Lace Bugs *Corythucha*	Elm	Chittenden Lamoille Washington Counties	Moderate to heavy defoliation of elms as in 1987, but a little more widespread.
Large Aspen Tortrix *Choristoneura conflictana*			Not observed.
Linden Looper *Erranis tiliaria*		Lamoille Orange Washington Counties	Occasional larvae observed.
Locust Leaf Miner *Odontata dorsalis*	Black Locust	All areas except Northeast Kingdom	Scattered light defoliation in most areas; two acres of heavy defoliation in Fairlee village.

OTHER HARDWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Rose Chafer *Macrodactylus subspinosus*	Hardwoods Ornamentals	Lamoille County	A few seen.
Saddled Prominent *Heterocampa guttivata*			See narrative.
Satin Moth *Leucoma salicis*	Silver Poplar Balsam Poplar	Johnson Ryegate	Only two reports.
Solitary Leaf Roller *Sparganothis pettitana*	Sugar Maple	Chittenden Franklin Lamoille Counties	Scattered light populations; increasing over 1987 levels.
Solitary Oak Leaf Miner *Cameraria hamadryadella*			Not observed.
Spiny Elm Caterpillar *Nymphalis antiopa*			Not observed.
Spring Cankerworm *Paleacrita vernata*			Not observed.
Uglynest Caterpillar *Archips cerasivoranus*	Cherry	Widespread	Scattered light defoliation similar to 1987.

Softwood Defoliators

Spruce Budworm, Choristoneura fumiferana, populations continued at extremely low levels in 1988 with no aerially visible defoliation for the fifth consecutive year. No budworm larvae were seen this year, and only three of 60 pheromone traps deployed by our department caught any moths.

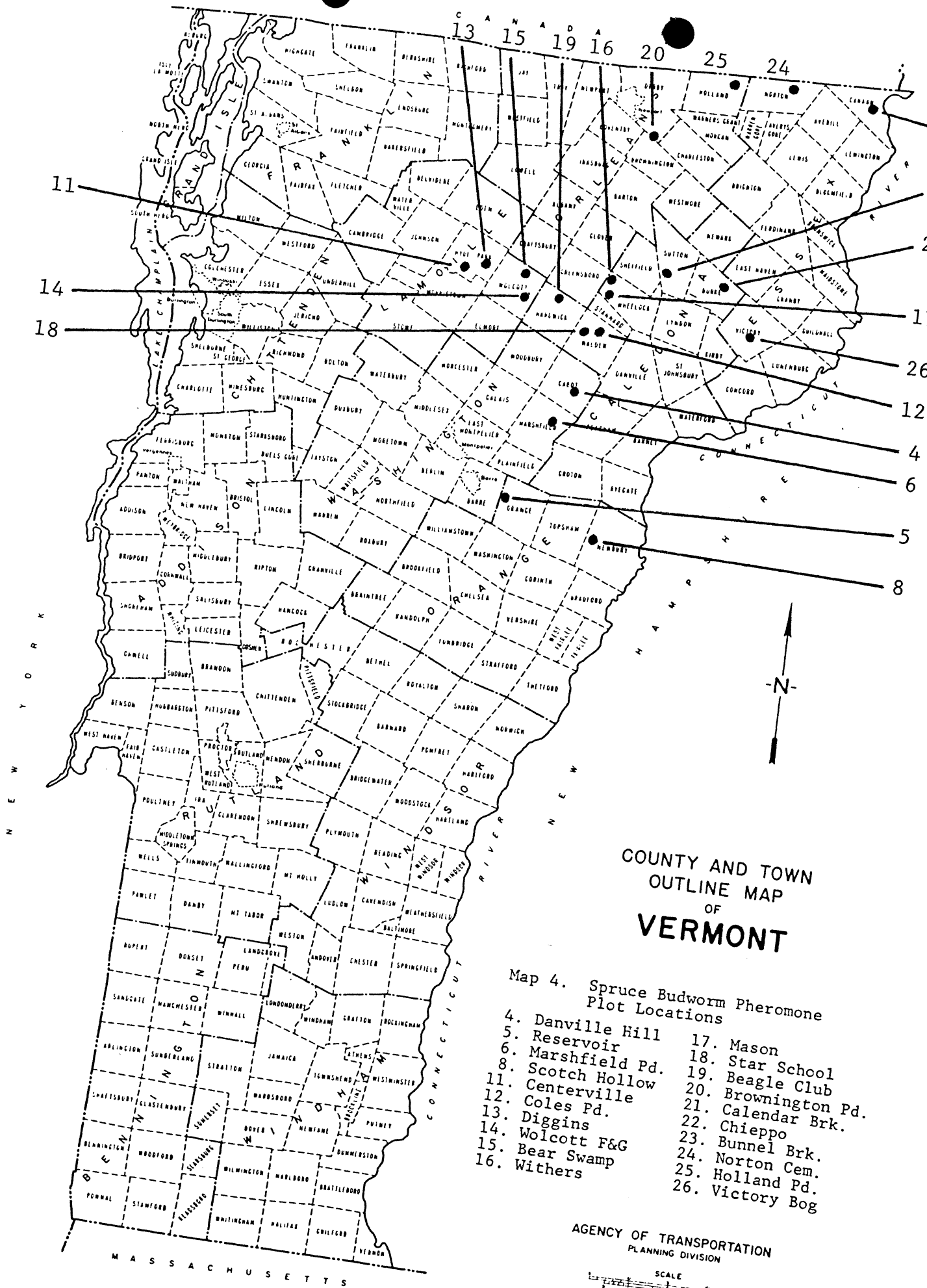
Pheromone traps were deployed in 20 stands this year compared to 19 in 1987 and 15 in 1986 (Map 4). Each plot consisted of three Multi-pher traps in a cluster, using the same lure and trap as in 1986 and 1987. Moth catch per trap per site averaged 0.05 this year compared to 0.01 in 1987 and 1.2 in 1986 (Table 3), indicating a continuation of very low population numbers. U.S. Forest Service traps on the Green Mountain National Forest have caught similarly few moths during the past three years (Table 3).

Table 3. Spruce budworm moth catch in pheromone traps, 1986-1988

Location	Average number of moths per trap per site					
	1986	n[1]	1987	n[1]	1988	n[1]
FP&R plots-NE VT[2]	1.2	(15)	0.01	(19)	0.05	(20)
USFS plots-GMNF[3]	0.0	(6)	0.0	(6)	0.05	(6)

1. n = number of sites
2. Multi-pher traps: 3/cluster in 1988, 3-5/cluster in 1987, and 5/cluster in 1986. PVC lures-0.03% by wt.
3. Same traps and lures, 3 traps per site, data from I. Millers, USDA-Forest Service, S&PF, Durham, NH

No new tree mortality attributable to spruce budworm was detected during the annual aerial survey.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Map 4. Spruce Budworm Pheromone Plot Locations

4. Danville Hill
5. Reservoir
6. Marshfield Pd.
8. Scotch Hollow
11. Centerville
12. Coles Pd.
13. Diggins
14. Wolcott F&G
15. Bear Swamp
16. Withers
17. Mason
18. Star School
19. Beagle Club
20. Brownington Pd.
21. Calendar Brk.
22. Chieppo
23. Bunnel Brk.
24. Norton Cem.
25. Holland Pd.
26. Victory Bog

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OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Arborvitae Leaf Miner *Argyresthia thuiella*	Arborvitae Northern White Cedar	Widespread	Heavy defoliation in many areas, particularly Barre Town and Berlin. Forest trees and ornamentals.
Pine False Webworm *Acantholyda erythrocephala*	Red Pine	Albany Middlebury	Light damage to ornamentals.
Introduced Pine Sawfly *Diprion similis*	White Pine Scots Pine		Not observed despite numerous sitings on Christmas trees in 1986 and 1987.
Larch Casebearer *Coleophora laricella*	European Larch Japanese Larch Eastern Larch	Widely scattered	Mostly light but increasing populations, similar to 1987.
Larch Sawfly *Pristophora erichosonii*			Not observed.
Pine Webworm *Tetralopha robustella*			Not observed.
Red-Headed Pine Sawfly *Neodiprion lecontei*	Red Pine	East Haven	Light damage to ornamentals.
Spruce Bud Moth *Zeiraphera canadensis*	White Spruce	Caledonia Essex, Orleans Lamoille Counties	Scattered trace damage, little change since 1987.
Spruce Sawfly Unidentified species possibly Little Spruce Sawfly	Red Spruce	Randolph	About five acres of heavy defoliation in a 20 year old plantation. Adjacent white and Norway spruce only lightly defoliated

OTHER SOFTWOOD DEFOLIATORS

INSECT	HOST(S)	LOCALITY	REMARKS
Spruce Budworm *Choristoneura fumiferana*			See narrative.
White Pine Sawfly *Neodiprion pinetum*			Not observed.
Yellow-headed Spruce Sawfly *Pikonema alaskensis*			Not observed despite some reports in previous years.

SAPSUCKING INSECTS, MIDGES, AND MITES

Aphids, Periphyllus spp., especially Periphyllus americanus and P. testudinacea, were very common on sugar maple throughout the region. These aphids are very similar to P. lyropictus, the Norway maple aphid, which occurs primarily on Norway maple. Periphyllus aphids are unusual in that they produce modified first instar larvae called dimorphs during the summer. The dimorphs are white, flattened, translucent, and immobile and can be found pressed against the undersides of the leaves during mid-summer, resuming normal development later in the season. Some heavily infested trees suffered no apparent damage while others suffered some leaf yellowing or premature leaf drop that may have been caused by the aphids.

Lecanium Scale, Lecanium sp., was common on red oak and sugar maple throughout the region, but the only heavy populations observed were on ornamental oaks. Elsewhere, populations appeared to be lighter than in 1987 for most locations.

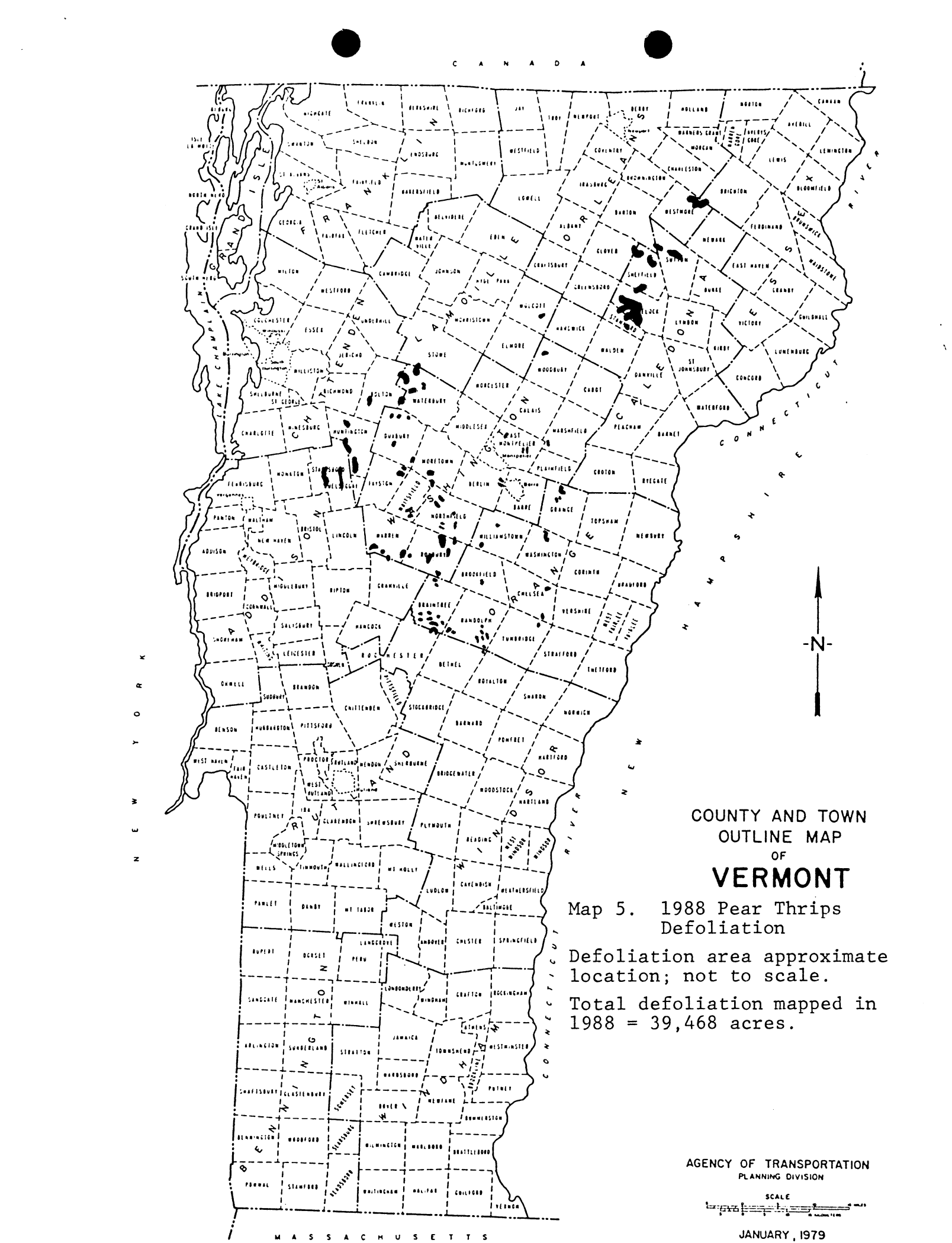
Oystershell Scale, Lepidosaphes ulmi, continued to cause light to moderate twig and branch mortality of American beech. It was especially common in Orleans, Washington, and Orange Counties, but appeared to be less noticeable in Franklin and Chittenden Counties compared to 1987.

An evaluation of scale population levels within Camel's Hump State Forest in Huntington showed little change between 1987 and 1988 (Table 4). Although the average number of scale insects per twig for current year's growth dropped slightly from 1987 to 1988, the number of insects per millimeter increased due to a reduction in twig length. It was interesting to note that beech internode length on the branches sampled was about twice as long for 1985 (the year following the wettest growing season in recent years) as for 1984 or any year since 1985.

Table 4. Number of oystershell scales on current year twigs in Camel's Hump State Forest, 1987-1988.[1]

	Ave. number of mature viable scales on current year's growth per			
	twig		millimeter	
Tree Dominance	1987	1988	1987	1988
Suppressed	3.7	3.4	0.10	0.22
Intermediate	6.8	2.8	0.07	0.12
Codominant	9.3	8.8	0.28	0.64

1. Average number for 10 branches from one tree per dominance class, collected in September 1987 and September 1988.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

Map 5. 1988 Pear Thrips Defoliation

Defoliation area approximate location; not to scale.

Total defoliation mapped in 1988 = 39,468 acres.

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Pear Thrips, Taeniothrips inconsequens, populations exploded this year, going from low levels with only very light damage detected in 1987, to very high populations, with almost 40,000 acres of sugar maple defoliation visible from the air in 1988 (Map 5, Table 5). This is an underestimate of actual acreage damaged, since much of the light to moderate defoliation could not be aerially detected. The heaviest damage occurred in Orange and Washington Counties. The primary host is sugar maple, but many other tree species within heavily infested areas were damaged to some extent, including red maple, black cherry, white ash, yellow birch, and American beech. The response of black cherry to thrips attack appeared to be early leaf drop and refoliation, while other species tended to hold damaged leaves that were not completely destroyed into, and sometimes through, the summer. Refoliation on heavily damaged sugar maples was slow, probably due to the May and June drought conditions, with most refoliation delayed until mid to late June. In general, defoliation had to reach 50 percent of normal leaf surface area before any refoliation occurred and many trees only partially refoliated.

Twig and branch mortality was evident on many damaged sugar maples by early June. The fungus Steganosporium, believed to be an opportunistic pathogen that kills weak branches, was commonly associated with branch mortality (see Stem Diseases).

One sugarbush in Braintree was aerially sprayed with carbaryl (Sevin) on 27 May to determine whether thrips populations could be suppressed for the next year by controlling the larval stage after adult feeding damage had already occurred. Larvae were already migrating into the ground by the time the trees were sprayed, and only 50 percent mortality of larvae was achieved.

In response to the statewide extent of damage, a Governor's Technical Task Force on Pear Thrips was established and supplemental funding was obtained for needed research and survey, as well as for a Pear Thrips Coordinator position. Five well-attended public meetings were held in the counties of Bennington, Windsor, Windham, Rutland, and Orange during July. Sugarbush Management Recommendations for Thinning Forest Stands Infested by the Pear Thrips were mailed to foresters in the state. Both are available from our department.

Table 5. 1988 Pear thrips defoliation

County	Light	Moderate	Heavy	Total
Addison	2,700	2,700	725	6,125
Caledonia	5,051	343		5,394
Chittenden	1,100	1,628	350	3,078
Franklin-Grand Isle	100			100
Lamoille		170	50	220
Orange		6,106	2,845	8,951
Orleans	287	604		891
Washington		12,694	2,015	14,709
Total	9,238	24,245	5,985	39,468

OTHER SAPSUCKING INSECTS, MIDGES AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Aphids	Many	Widespread	See narrative.
Aphids *Cinara sp.*	Balsam Fir White Pine	Scattered	Few sightings or reports compared to 1987.
Balsam Gall Midge *Paradiplosis tumifex*	Balsam Fir	Widespread in northern Vermont	Some moderate to heavy Christmas tree damage now beginning to show up in scattered locations; expected to increase in 1989.
Balsam Twig Aphid *Mindarus abietinus*	Balsam Fir	Widespread	Mostly light to moderate Christmas tree damage similar to 1987; moderate damage recorded for 167 acres out of 200 Christmas tree acres where twig aphid was detected.

OTHER SAPSUCKING INSECTS, MIDGES AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Balsam Woolly Adelgid *Adelges piceae*	Balsam Fir	Groton	Light populations evident following several years of absence.
Beech Scale *Cryptococcus fagisuga*	Beech		See Beech Bark Disease
Birch Budgall Mite *Aceria rudis*	Birch	Jericho	
Cooley Spruce Gall Adelgid *Adelges cooleyi*	Blue Spruce White Spruce	Barre	Occasionally observed; down from 1987.
Cottony Maple Scale *Pulvinaria innumerabilis*	Sugar Maple	Roxbury Vershire	A few individuals seen.
Eastern Spruce Gall Adelgid *Adelges abietis*	Red Spruce White Spruce	Widespread	Remains common; heavy damage to individual ornamentals and light to moderate damage in three Christmas tree plantations.
Leafhoppers	Sugar Maple Msc. hardwoods	Widespread	Very light damage noticed.
Lecanium Scale *Lecanium* sp.	Red Oak Sugar Maple	Widespread	See narrative.
Maple Spindle Gall Mites *Vasates aceris-crumena*	Sugar Maple	Throughout	Common.

OTHER SAPSUCKING INSECTS, MIDGES AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Norway Maple-type Aphid *Periphyllus americanus* and *Periphyllus testudinacea*			See aphids in narrative.
Oystershell Scale *Lepidosaphes ulmi*			See narrative.
Pear Thrips *Taeniothrips Inconsequens*			See narrative.
Pine Bark Aphid *Pineus strobi*	White Pine	Widespread	Remains common.
Pine Leaf Adelgid *Pineus pinifoliae*	White Pine	Lyndon	Heavy on white pine understory at Lyndon S.F.
Pine Needle Midge *Contarinea baeri*	Scots Pine	Addison County	Light damage throughout a Christmas tree plantation in Lincoln; trace damage common elsewhere, same as in 1987.
Pine Needle Scale *Chionapsis pinifoliae*	White Pine Mugho Pine	Widely scattered	Mostly light on ornamentals.
Pine Spittlebug *Aphrophora parallela*	Conifers	Widespread	Light to moderate infestations reported on over 100 acres of Scots pine Christmas trees; up from 1987.
Pine Thrips *Gnophothrips sp.*	Scots Pine	Lincoln Eden	Moderate damage to scattered Christmas trees.

OTHER SAPSUCKING INSECTS, MIDGES AND MITES

INSECT	HOST(S)	LOCALITY	REMARKS
Pine Tortoise Scale *Toumeyella parvicornis*	Scots Pine		Not observed.
Root aphid *Prociphilus americanus*	Balsam Fir Fraser Fir	Elmore Morristown Georgia Brownington Craftsbury Lyndon	Fewer aphids present in previously infested Christmas trees; 16% of 25 plantations checked by Jon Turmel in 1988 had aphids.
Spruce Bud Scale *Physokermes piceae*			Not observed.
Spruce Spider Mite *Oligonychus ununguis*	Fraser Fir Balsam Fir Red Spruce Arborvitae Locust		Remains a problem in a few Christmas tree plantations; more on ornamentals this year.
Treehoppers *Membracidae*			Not observed.
Woolly Alder Aphid *Prociphilus tessellatus*	Silver Maple Alder	Widespread	Unusually heavy on ornamentals this year.
Woolly Apple Aphid *Eriosoma lanigerum*	American Elm	Derby Line	Ornamental.

BUD, SHOOT AND STEM INSECTS

The balsam shootboring sawfly, Pleroneura bruneicornis, caused moderate to heavy damage to balsam and fraser fir Christmas trees this year and was of concern to some growers. The adults lay eggs into the buds soon after the bud scales have dropped and the white larva that hatches bores within the newly emerging shoot, causing the tip to appear flattened at first. Eventually, the new growth tips turn reddish-brown and die, looking much like frost damage. Unlike frost damaged tips, however, they can be easily plucked from the tree to reveal the hollowed-out shoot.

Damage to balsam fir this year was might lighter in plantations sprayed early (near bud break) with diazinon for control of balsam twig aphid than in unsprayed plantations. This suggests that this would be the best timing and material for control of this insect. However, in 10 years of observing this sawfly, it has always been heaviest every other year, in even years only, with only light populations in odd years. It probably has a two year life cycle, with the majority of the population emerging in even years. Therefore, control should not be necessary in 1989 but heavy populations could appear again in 1990.

BUD, SHOOT AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Ambrosia Beetle Scolytidae	White Birch	Sherburne	
Balsam Shoot-boring Sawfly Pleroneura bruneicornis	Balsam Fir	Widespread	See narrative.
Butternut Curculio Conotrachelus juglandis			Not observed.
Coneworm Diorytria spp.	Fraser Fir	Elmore	Moderate shoot damage (resembling frost) to scattered individual Christmas trees.

BUD, SHOOT AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Locust Borer *Megacyllene robiniae*			Not observed.
Maple Petiole Borer *Caulocampus acericaulis*			Not observed.
Northern Pine Weevil *Pissodes pproximatus*			Not observed.
Pales Weevil *Hylobius pales*	Scots Pine	Widespread	25 acres of mostly light damage to Christmas trees detected; down considerably from the 287 acres in 1987.
Pine Gall Weevil *Podapior gallicola*			Not observed.
Pitted Ambrosia Beetle *Corthylus punctatissimus*	Sugar Maple Seedlings	Highgate	Moderate mortality of seedlings in one sugarbush.
Pseudanthonomus validus	Yellow Birch	Johnson Stowe Duxbury	This weevil causes the "Glastonbury Wilt" symptom last seen in southern VT in 1976. Weevil larvae bore in the petiole, causing individual leaves to wilt and die.
Round-headed Apple Tree Borer *Saperda candida*	Apple	Essex	
Twig Pruner *Elaphidionoides villosus*			Not observed.

BUD, SHOOT AND STEM INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
White Pine Weevil *Pissodes strobi*	White Pine Scots Pine Blue Spruce Norway Spruce White Spruce Red Spruce	Widespread	Remains common; light to moderate damage to 62 acres of white pine Christmas trees.
White Spotted Sawyer *Monochamus scutellatus*			Not observed.

BARK BEETLES

Bronze Birch Borer *Agrilus anxius*			Not observed.
Eastern Larch Beetle *Dendroctonus simplex*	American Larch	Widespread	Associated with larch decline.
Elm Bark Beetles *Hylurgopinus rufipes* *Scolytus multistraitus*	American Elm	Widespread	See Dutch Elm disease.
Hemlock Borer *Melanophila fulvoguttata*			Not observed.
Pine Engraver *Ips pini*	Red Pine	Barnet Lyndon	Mature pines severely damaged.
Red Turpentine Beetle *Dendroctonus valens*			Not observed.

Root Insects

The Conifer Swift Moth, Korsheltellus gracilis, formerly called the Ghost Moth, continues to be found associated with feeding wounds on the roots of balsam fir and red spruce at high elevations in northern Vermont. An update on research being conducted by the University of Vermont will be submitted when available.

OTHER ROOT INSECTS

INSECT	HOST(S)	LOCALITY	REMARKS
Broad Necked Root Borer Prionus laticollis			Not observed.
Conifer Swift Moth Korsheltellus gracilis			See narrative.

FOREST DISEASES

Stem Diseases

Beech Bark Disease, caused by Cryptococcus fagisuga and Nectria coccinea var. faginata, continues to be increasingly visible. Heavy scale populations were observed on many individual trees in widely scattered locations and Nectria fruiting is also more common than a few years ago. Heavy scale populations are particularly common where beech is mixed with hemlock. The hemlock is thought to protect the insects from widely fluctuating temperatures (solar heating) during the winter months. Expect scale populations to increase as long as mild winters continue.

Caliciopsis Canker, caused by Caliciopsis pinea, continues to be evident in many white pine stands, particularly in eastern Orange County. Heavy resin flow on heavily infected trees resembles white pine blister rust. New stands with infection include one at Ainsworth State Forest and one in Plainfield. Heavily infected trees often have unhealthy appearing crowns, but no mortality has yet been observed.

Dutch Elm Disease, caused by Ceratocystis ulmi, caused a greater than usual amount of mortality again this year. According to U.S. Forest Service Pathologist Dave Houston, an aggressive strain of the fungus is becoming more abundant in the state and is likely responsible for the increase in elm mortality. The 1986 Vermont Hardwood Tree Health Survey estimated that 34 percent of the dominant/codominant American elms in the state were dead, excluding snags. Most of this mortality was due to Dutch elm disease.

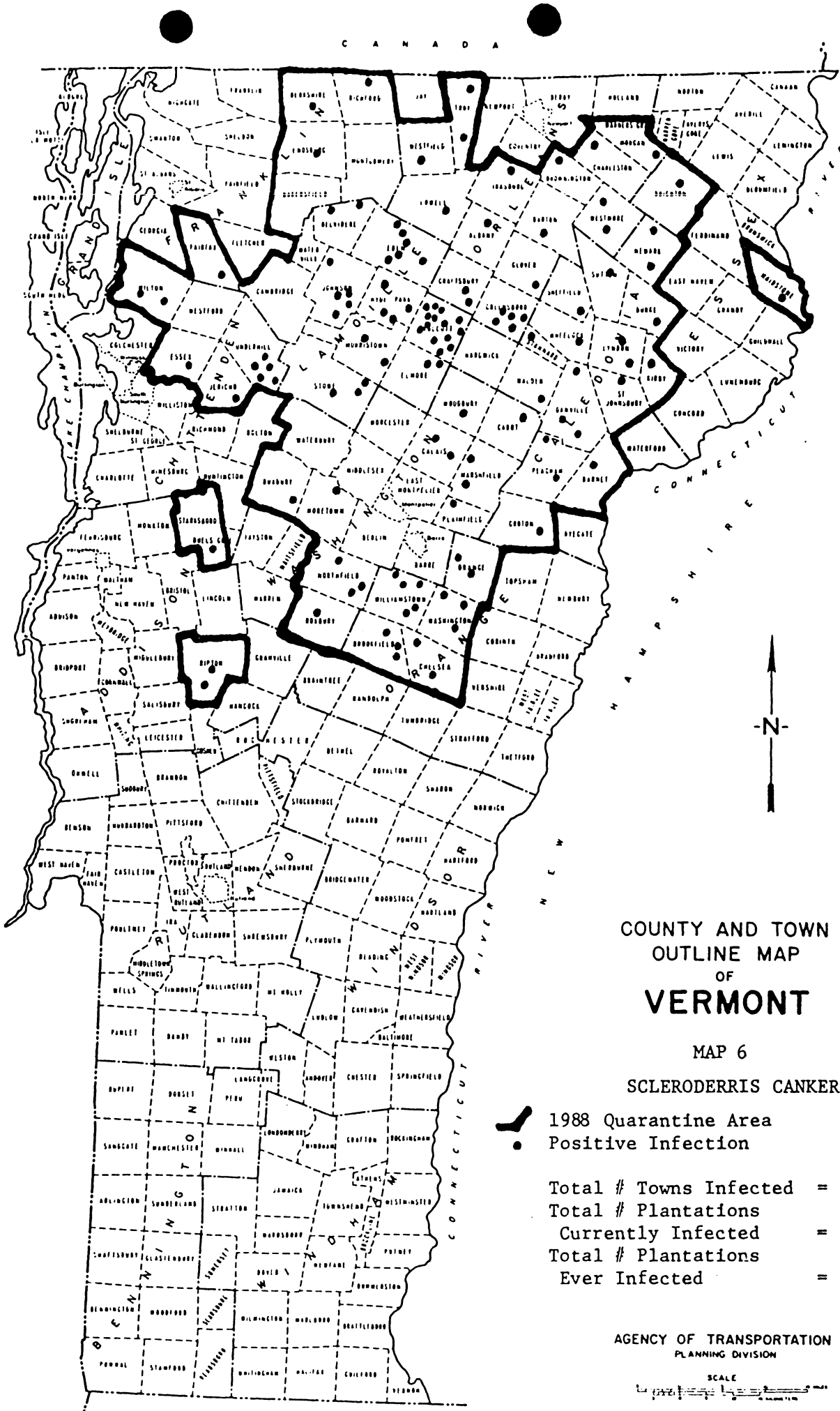
Scleroderris Canker, caused by Ascocalyx abietina, was not found in any new locations this year, for the second year in a row. A total of 54 Christmas tree plantations within the quarantine zone (Map 6) and 122 red and Scots pine plantations bordering the quarantine were surveyed for presence of Scleroderris, all with negative results.

Pine Christmas trees within 33 quarantined towns were inspected as well as red and Scots pine plantations within 27 border towns.

Scleroderris infection was not observed during a survey of white pine seedlings that were planted in 1984 in a small clearcut, within a heavily infected Scots pine plantation in Lyndon State Forest. These seedlings averaged 29 percent infection in 1985. A sanitation removal of nearby Scots pine regeneration was undertaken that year and percent infection dropped to 12 percent in 1986 and was present but scarce in 1987. Natural white pine and Scots pine regeneration beneath the infected Scots pine overstory averaged 13 and 37 percent infection, respectively, in 1988 compared to 12 and 34 percent in 1987.

The total number of plantations in the state known to be infected remains at 124, consisting of 106 red pine and 18 Scots pine plantations (Map 6). This represents 842 and 150 acres, respectively, for a total of 992 acres infected. Another six plantations were infected at one time, but have since had the disease eradicated or the trees cut. Some recent infection can be found within most of the quarantine zone.

Steganosporium species, an opportunistic fungus that attacks and kills weakened stems, was extremely abundant this year in association with current branch and twig dieback, particularly on sugar maple. This fungus is sometimes referred to as the Armillaria of branches, since it is presumably a weak pathogen that can become very aggressive in attacking weakened branches. The black, protruding spore masses were frequently found at the junction of live and dead wood on branches that had recently died, either due to stress from thrips attack or largely unknown reasons, thought to be primarily due to drought stress.



COUNTY AND TOWN OUTLINE MAP OF VERMONT

MAP 6

SCLERODERRIS CANKER

1988 Quarantine Area

Positive Infection

Total # Towns Infected = 64

Total # Plantations Currently Infected = 124

Total # Plantations Ever Infected = 130

AGENCY OF TRANSPORTATION
PLANNING DIVISION

SCALE

JANUARY 1979

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Butternut Canker *Sirococcus clavigignenta-juglandacearum*	Butternut	Montpelier	One roadside tree infected, the only new report in 1988.
Beech Bark Disease *Cryptococcus fagisuga* and *Nectria coccinea* var. *faginata*			See narrative.
Black Knot *Dibotryon morbosum*	Black Cherry	Widespread	Cankers abundant.
Caliciopsis Canker *Caliciopsis pinea*	White Pine	Widespread	See narrative.
Chestnut Blight *Cryphonectria parasitica*	Chestnut		Not observed.
Cytospora Canker *Leucostoma kunzei*	Blue Spruce	Widespread	Common on ornamentals.
Diplodia Shoot Blight *Diplodia pinea* (*Sphaeropsis pinea*)	Red Pine	Lamoille County	Observed on a few roadside trees.
Dutch Elm Disease *Ceratocystis ulmi*	Elms	Widespread	Mortality continues at a moderate, sustained pace; many trees died quickly this year, probably due to drought.
Eastern Dwarf Mistletoe *Arceuthobium pusillum*	Red Spruce		No new locations discovered.
Fir Broom Rust *Melampsorella caryophyllacearum*	Balsam Fir	Widely scattered	Brooms fairly common in fir stands.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Fireblight *Erwinia amylovora*	Mountain Ash Crabapple	Widespread	Not observed despite numerous reports in 1987.
Hypoxylon Canker *Hypoxylon pruinatum*	Quaking Aspen	Throughout	Light to moderate mortality common.
Oak Wilt *Ceratocystis fagacearum*	Oaks	Absent	No suspects seen by trained observers during aerial flights.
Polyporus tomentosus	White Spruce	Hardwick	Necessitated a salvage cut in a Hardwick town forest plantation; preliminary data indicates a sawlog volume loss of 40% for infected trees.
Red Ring Rot *Phellinus pini*	Norway Spruce	Hardwick	Responsible for some volume loss along with *Polyporus tomentosus* in Hardwick town forest.
Sapstreak *Ceratocystis coerulescens*	Sugar Maple	Plainfield Williamstown Corinth Danville	Several trees in sugarbushes and maple stands had the characteristic staining pattern in the root-flare region.
Scleroderris Canker *Asocalyx abietina*			See narrative.
Sclerotinia kerneri	Balsam Fir	Orleans Caledonia Counties	Heavy damage observed in one stand in Sheffield.
Sirococcus Shoot Blight *Sirococcus strobilinus*	Red Pine	Plainfield Jones S.F.	Some new infections discovered in different area from 1987.

OTHER STEM DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Verticillium Wilt *Verticillium albo-atrum* or *V. dahliae*	Sugar Maple		Not observed.
White Pine Blister Rust *Cronartium harknessii*	White Pine	Widespread	Causing moderate losses in 2 of 9 Christmas tree plantations infected (31 of 72 acres); littl change from 1987 in mortality but recent infections more scarce.
Woodgate Gall Rust *Endocronartium harknessii*	Scots Pine	Widespread	Detected in 7 Christmas tree plantations comprising 85 acres. About 70 acres had heavy shoot and branch mortality; down slightl from 1986.

FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Anthracnose *Gloeosporium* spp.	Sugar Maple	East Haven Sutton	Trace damage at higher elevations; down from 1987.
Cedar-Apple Rust *Gymnosporangium juniperi-virginianae*	Eastern Red Cedar Apple	Chittenden	Some urban calls.

FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Cyclaneusma Needlecast (formerly Naemacyclus) *Cyclaneusma minus*	Scots Pine	Widespread	Moderate Christmas tree damage in 4 of 8 plantations infected, comprising 75 acres; also at state nursery. Little change since 1986.
Fir-Fern Rust *Uredinopsis mirabilis*	Balsam Fir	Widespread in northern VT	Continued very light levels in Christmas tree plantations this year, similar to 1987.
Lophodermium Needlecast *Lophodermium seditiosum*	Scots Pine	Widespread in scattered locations	Only light damage to Christmas trees; down slightly from 1987.
Poplar Leaf Bronzing	Balsam Poplar	Caledonia County	Unknown cause.
Rhabdocline Needlecast *Rhabdocline pseudotsugae*	Douglas Fir Christmas trees	Williamstown	Continues in previously heavily infected plantations; not observed elsewhere.
Rhizosphaera Needlecast *Rhizosphaera kalkhoffi*	Blue Spruce	Underhill	Causing heavy needle loss in one location.
Swiss Needlecast *Phaeocryptopus gaumani*	Douglas Fir	Hardwick Bakersfield Essex Stowe	Continues in previously infected plantations but damage somewhat reduced.

FOLIAGE DISEASES

DISEASE	HOST(S)	LOCALITY	REMARKS
Tar Spot *Rhytisma acerinum*	Red Maple Sugar Maple	Scattered	Only occasionally seen.

ROOT DISEASES

Annosus Root Rot *Heterobasidion annosum*	Red Pine		No new reports this year.
Shoestring Root Rot *Armillaria* spp.	Many	Widespread	Continues common on declining trees. White pine seedling mortality at Lyndon S.F. now down to 1%.

DIEBACKS, DECLINES AND ENVIRONMENTAL DISEASES

ASH DIEBACK and mortality remains common, particularly in the Champlain Valley, with some dieback in the central part of the region, and very little dieback in the Northeast Kingdom. No new reports of "ash yellows" disease as a cause of the dieback were received.

BIRCH DECLINE continues to be evident, particularly in the northern part of the state and especially at upper elevations.

FROST DAMAGE from several June frosts occurred this year in mountainous sections of the region, but it caused mostly scattered, light damage particularly to balsam fir. Frost injury was detected in 10 Christmas tree plantations compared to 24 in 1987. Moderate to heavy damage to balsam fir, fraser fir, white spruce and Douglas fir did occur on 84 acres in Brookfield, Craftsbury, Morristown and Hyde Park, but most of this was for seedlings or transplant-age trees.

DIEBACKS, DECLINES AND ENVIRONMENTAL DISEASES

LARCH DECLINE continues to spread outward from recently dead trees within eastern larch stands. The eastern larch beetle continues to be associated with the decline. New areas mapped during aerial survey this year totaled 646 acres, with the most damage in Caledonia County (Table 6). This is not as heavy as it was several years ago, but is an increase over 1987 detections. This year's drought may be responsible for the increase and could result in a further acceleration in the decline over the next year or two.

Table 6. 1988 acres of new larch decline

County	Acres
Orleans	149
Caledonia	416
Essex	81
Total	646

MAPLE DECLINE continues to be a concern to forest landowners, sugarmakers, and the general public. No new areas of decline were identified during the aerial survey this year, but areas identified in past years often remain visible. No clear trend in maple decline is evident in the northern region. Some stands appear to be improving while others continue to deteriorate at varying rates. In the Northeast Kingdom, decline in stands that had been previously heavily thinned was particularly noticeable, with the drought conditions resulting in leaf scorch, curling, branch dieback and, in some cases, tree mortality.

Our department began participating in a Canada-USA cooperative research effort on maple decline research this year called the North American Maple Project (NAMP). This project was designed by the U.S. Forest Service to study the nature and severity of sugar maple decline in both high and low sulfate deposition areas over the next three years using the same evaluation methods. The plots are evenly distributed between sugarbushes and forested maple stands. We established 26 plots in Vermont this year, which were rated for tree health during July and August and will be rated again in future years. Seven northern states and four eastern provinces are cooperating in the project. Changes in tree health over time will be compared to amounts of polluntants received to see if a cause and effect relationship exists.

RED SPRUCE DECLINE continues throughout the state, particularly on high elevation and dry sties. No new areas of decline were reported.

DIEBACKS, DECLINES AND ENVIRONMENTAL DISEASES

SUGAR MAPLE DIEBACK was very common throughout the region this year, beginning in June and continuing throughout the summer. Affected branches leafed out normally, but then the leaves wilted and turned brown, much the same as for Verticillium wilt symptoms, but no Verticillium could be found. This malady was widespread throughout the region, but was particularly heavy in Orange County. Branches scattered throughout the crown died but usually they were concentrated in the lower half of the crown. This was particularly noticeable on roadside maples. Occasionally, the same symptoms were seen on red maple and other hardwoods. This branch dieback was sometimes associated with heavy flowering and sometimes with thrips injury, but most often by neither. Drought stress is thought to be the primary cause. Similar branch dieback was noticed throughout the lower crowns of oak and elm growing on a dry but normally wet site in Waterbury in June. Steganosporium, an opportunistic fungus capable of killing weakened branches, could almost always be found fruiting at the junction of live and dead wood on affected maple branches. Many sugar maples lost a few branches, but some were observed to lose 30 percent or more of their crown.

TRANSPLANT FAILURES due to the early summer drought were common, especially in the Champlain Valley where heavy mortality occurred in some plantations.

WIND DAMAGE occurred sporadically throughout much of the region this year. Severe windthrow occurred in Troy and Derby from two separate storms.

WHITE PINE NEEDLE BLIGHT was not observed this year for the first time in five years. This despite the fact that the Department of Environmental Conservation measured the highest levels of ozone ever recorded in this state this summer.

ANIMAL DAMAGE

ANIMAL	SPECIES DAMAGED	LOCALITY	REMARKS
Beaver	Many	Widespread	Flooding damage increasing with increasing populations.
Deer			Not observed.
Moose			Not observed.
Mouse			Not observed.
Porcupine	Many	Scattered	Mostly light damage but increasing in frequency.
Sapsucker	White Birch	Lamoille County	Several homeowner complaints; damage heavy.
Squirrel	Maple tubing	Widespread	Complaints down from last year.